

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 16039-PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 00/29212	International filing date (day/month/year) 23/10/2000	(Earliest) Priority Date (day/month/year) 22/10/1999
Applicant THE GOVERNMENT OF THE UNITED STATES		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1

None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

An electroactive device (100) comprises at least two layers (112,114) of material, wherein at least one layer is an electroactive material and wherein at least one layer is of non-uniform thickness. The device can be produced in various sizes, ranging from large structural actuators to microscale or nanoscale devices. The applied voltage to the device in combination with the non-uniform thickness of at least one of the layers (electroactive and/or non-electroactive) controls the contour of the actuated device. The effective electric field is a mathematical function of the local layer thickness. Therefore, the local strain and the local bending/torsion curvature are also a mathematical function of the local thickness. Hence the thinnest portion of the actuator offers the largest bending and/or torsion response. Tailoring of the layer thicknesses can enable complex motions to be achieved.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L41/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

INSPEC, COMPENDEX, EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 676 722 A (SCHAFFT HUGO W) 11 July 1972 (1972-07-11) column 3, line 26 -column 4, line 67; figure 3	1-7, 9, 11-15, 17, 18, 21-23, 33
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 13, 30 November 1999 (1999-11-30) & JP 11 238919 A (HONDA MOTOR CO LTD), 31 August 1999 (1999-08-31) abstract -& JP 11 238919 A (HONDA MOTOR CO LTD) 31 August 1999 (1999-08-31) the whole document	1-3, 5-7, 9, 11, 14, 15, 17, 18, 21, 33

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

9 February 2001

Date of mailing of the international search report

16/02/2001

Name and mailing address of the ISA

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 24 44 647 A (SIEMENS AG) 8 April 1976 (1976-04-08) the whole document ---	1-3,5-7, 9,11-15, 17,18,33
X	US 4 093 883 A (YAMAMOTO YUJIRO) 6 June 1978 (1978-06-06) column 15, line 22 -column 16, line 32; figure 13 ---	1-3,5-7, 9,11,14, 15,17, 18,33
X	GB 2 327 927 A (DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT) 10 February 1999 (1999-02-10) page 3, paragraph 3 -page 10, paragraph 3; figures ---	1,6,7,9, 11-15, 17,18, 21,25, 26,30, 31,33
A	GB 2 046 936 A (QUANTEL SA) 19 November 1980 (1980-11-19) page 1; figures ---	1-3,6,7, 13, 21-24,33
A	PATENT ABSTRACTS OF JAPAN vol. 008, no. 243 (E-277), 8 November 1984 (1984-11-08) & JP 59 121889 A (TOSHIBA CORP), 14 July 1984 (1984-07-14) abstract -----	1,16

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3676722	A	11-07-1972	DE 2048899 A	22-04-1971
			DE 7036800 U	07-01-1971
			FR 2064165 A	16-07-1971
			NL 7014671 A	08-04-1971

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GB 2327927	A	10-02-1999	DE 19712034 A	24-09-1998
			FR 2761047 A	25-09-1998
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			JP 62039721 B	25-08-1987
			US 4298247 A	03-11-1981

JP 59121889	A	14-07-1984	NONE	



Application No: GB 9806177.3
Claims searched: 1-14

Examiner: C B VOSPER
Date of search: 17 November 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.P): B7G(GCAP); B7W(WHBG,WHBM,WHBX,WHXX,WWE); F1V(VCT)
Int Cl (Ed.6): B 6 4 C
3/00,3/38,3/42,3/44,3/52,11/00,11/16,11/18,27/00,27/32,27/46,27/46
7,27/473
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2281268 A WESTLAND (whole document)	1-4, 7, 9, 10, 12
X	GB 2200411 A USUI (whole document)	1, 4, 5, 9-11 at least
X	GB 2149022 A ROLLS (fig. 3; page 2, line 56 et seq.)	1-4, 12 at least
X	GB 0870171 UNITED (whole document)	1, 2, 4-6, 10-12 at least
X	US 5662294 MACLEAN/LOCKHEED (fig. 2; col. 12, claim 1; col. 5, line 36 et seq.; col. 6, lines 47-53)	1, 2, 5, 8, 10, 12 at least
X	US 4922096 BRENNAN/SIMMONDS (whole document)	1-3, 5, 7, 12 at least
X	US 3885758 CROSWELL/THOMAS (col. 3, line 48 et seq.)	1, 2, 7, 8, 12 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.